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## Awareness of oral health prophylaxis in pregnant women

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**Abstract:** **Introduction:** During pregnancy, changes in the oral cavity occur due to fluctuations in hormone levels and changes in eating habits and hygiene.

**Objectives:** To evaluate pregnant women's awareness of oral health prophylaxis.

**Material and Methods:** An anonymous questionnaire was completed by 341 pregnant women from Malopolskie Voivodeship. The statistical analysis was carried out in the R program (v. 3.4.3); a p-value <0.05 was considered significant.

**Results:** Over half of the respondents did not receive oral hygiene instruction and did not take part in any prophylactic program. The main sources of oral health knowledge were the internet (66.3%), dentist (43.1%) and gynaecologist (17.9%). Respondents willingly followed the advice of healthcare workers. Approximately 32% of the surveyed women were aware of the most appropriate period for dental treatment (second trimester). Over half of the women admitted that they would receive dental care more often if more procedures were reimbursed. Approximately 71% of the women were aware of the increased susceptibility to tooth decay during pregnancy. The relationship between the presence of caries in parents and that in children was known by 42.1% of respondents, but 45% admitted they did not know how to take care of their child's teeth properly.

**Conclusions:** Women with a higher education level had better knowledge in the area of oral health. However, most of the respondents need to increase their knowledge in this area. Prophylactic programs should be broadly propagated, and healthcare workers should deliver essential information in daily practice.

**Key words:** pregnancy, oral hygiene, dental prophylaxis, gingiva, gingival inflammation.

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## Introduction

Proper body functioning depends on the systemic balance among many factors, including hormones. The endocrine system undergoes numerous changes. Fluctuations in hormone levels occur, particularly in women, during different stages of life, including puberty, menstruation, pregnancy and menopause [1]. The greatest variations in hormone secretions occur during pregnancy, when the functioning of the body changes diametrically within a short time. These variations also apply to the oral environment, which is influenced by high levels of sex hormones [1].

Oral diseases have a tremendous impact on the development of local pathologies but also on peripheral organs. An example is the influence of inflammatory reactions of periodontal tissues via the inflammatory cytokine network and mediators on many organ systems [2].

Levels of estrogens and progesterone increase significantly during the early stages of pregnancy, decrease during parturition and after placental expulsion, and return to pre-pregnancy levels after 2–3 days. Normalization of endocrine-dependent tissues occurs, also within the oral cavity [1]. Gingival tissue is subjected to steroids via blood vessels and to a lesser extent via saliva. The presence of steroid receptors in the periodontium has been demonstrated in gingival homogenates [3, 4]. The changes in gingival tissue during pregnancy are caused mainly by increases in vascularization and blood flow. Increases in hormone levels modulate the composition of the gingival flora and the local inflammatory response [5]. Clinical symptoms caused by inflammation of the gingiva occur during the second month of pregnancy and last until the eighth month. They recede at the end of gravidity, and the tissue status resembles the initial stage after parturition [6]. Most women believe that pregnancy worsens oral conditions [7, 8].

Good routine oral hygiene and proper nutritional habits during pregnancy may minimize the occurrence of inflammatory lesions within the oral cavity. Future mothers should focus their attention on potential pathologies, preferably before conception or at the beginning of pregnancy, through educational and prophylactic measures.

## Objectives

The aim of the study was to assess the knowledge status regarding oral disease prevention, and to identify factors affecting this knowledge, among pregnant women living in the Lesser Poland province. An overview of the available literature showed that no similar research has been conducted in this region of Poland.

## Materials and Methods

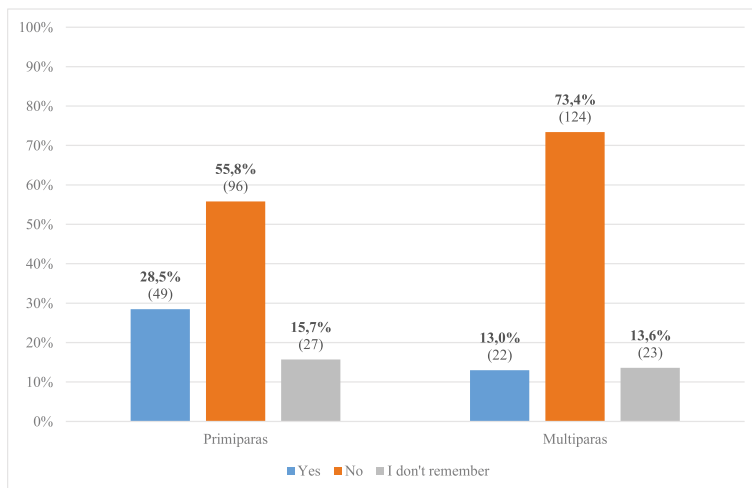
This study included 341 pregnant women who were under gynaecological care at hospitals, outpatient clinics or private offices located in the Lesser Poland region. Over one-half of the respondents (57.7%) were residents of the village, and the 42.3% lived in the city. The majority of respondents (61.2%) had a higher education, and 38.8% a secondary or basic education. Both multiparas and primiparas accounted for nearly one-half of the study population (49.6% and 50.4%, respectively).

The study was based on a questionnaire consisting of 31 original questions, created by referencing the current literature. The survey was divided into two parts. The first part concerned demographic and social factors, such as age, education, place of residence, earnings and the number of previous pregnancies. The second part concerned the sources of the subjects' knowledge about preventing oral diseases during pregnancy, hygiene and dietary habits of pregnant women, as well as the frequency of visits to the dentist. The final questions focused on the subjects' personal feelings on oral health and dental treatment and their knowledge in this area. Before entering the study, pregnant women received detailed information in written and oral form. In the event of additional questions, they had the opportunity to ask a dentist. The exclusion criterion was the lack of consent for participation in the study. The anonymous surveys were collected and secured, and the data were entered into a Microsoft Excel 2013 spreadsheet. Statistical analysis of the results was conducted using the non-parametric chi-square test with Yates' correction and Fisher's exact test in the statistical program R, version 3.4.3. A p-value <0.05 was considered significant.

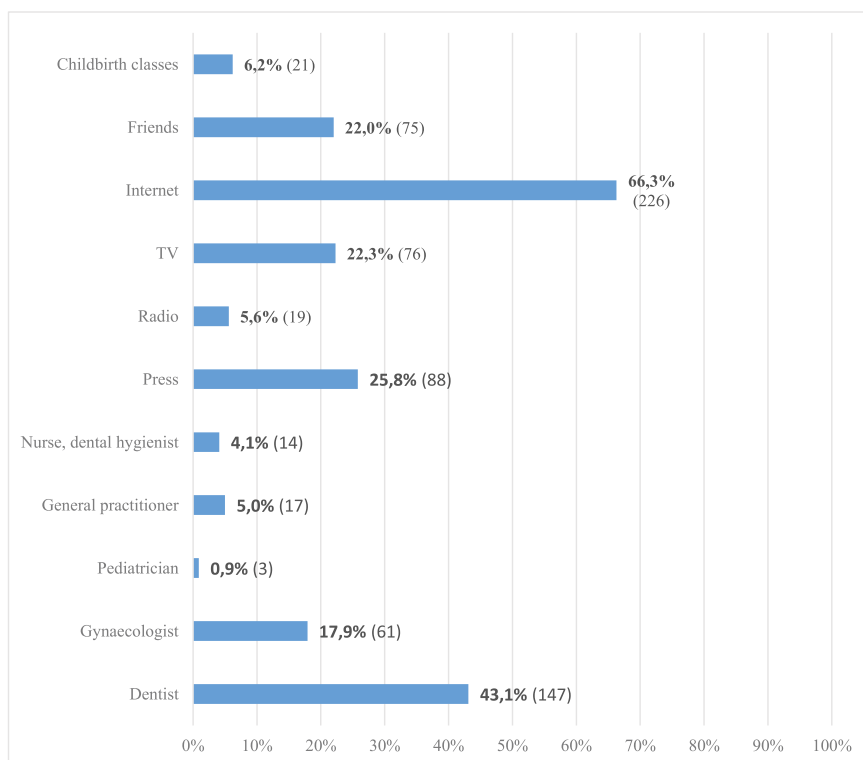
## Results

Professional oral hygiene instructions were not given by dentist or dental hygienist to 65.4% of the respondents. A similar percentage (64.5%) of women did not take part in an oral disease prophylaxis program. Primiparas participated in prophylactic programs more frequently (Fig. 1). The internet was the main source of oral health information for respondents (66.3%), followed by the dentist (43.1%). Approximately 18% received advice from gynaecologists, 5% from general practitioners and 6.2% during childbirth classes (Fig. 2). Respondents, particularly city dwellers, used the expert advice of healthcare workers (69.5%). Seeking information in public places (26.7%) and in mass media (32.8%) was less popular (Fig. 3). Nearly half of women (47.4%) assessed their level of knowledge concerning oral health as good or very good, 29.1% considered it sufficient. 23.4% of the respondents admitted the need to improve their knowledge.

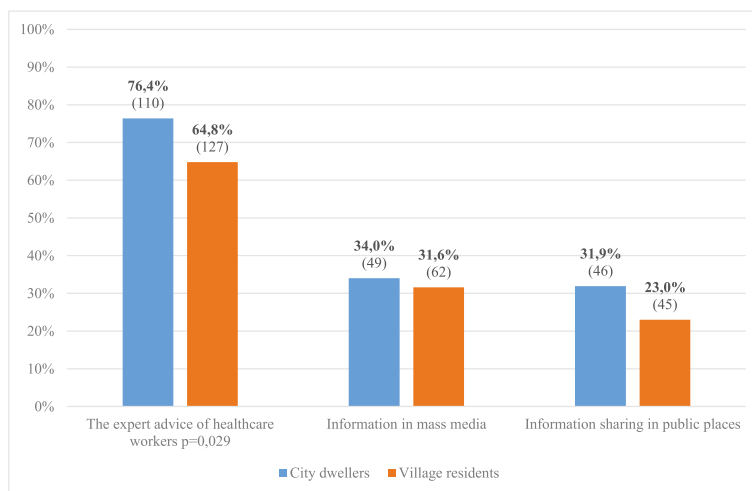
36.0% of the respondents received dental care every 6 months or more often, while 42.0% visited the dentist once a year. Nearly 13.0% sought dental care once in 2 years



**Fig. 1.** Did respondents take part in an oral disease prophylaxis program — in relation to the number of pregnancies? ( $p = 0.001$ )



**Fig. 2.** Patients' sources of oral health prophylaxis information.

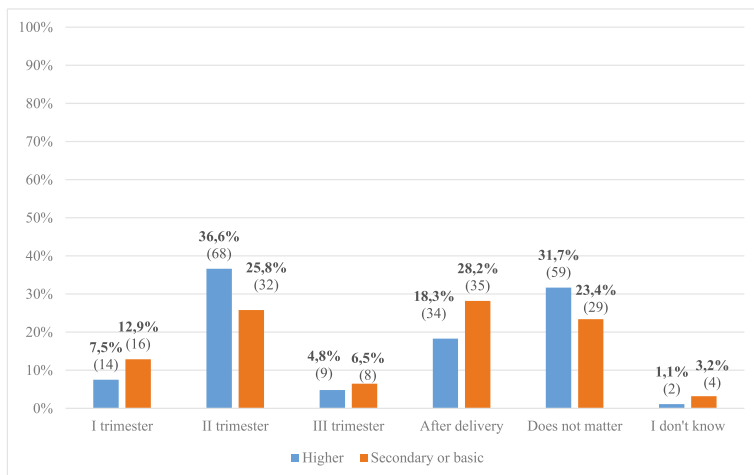


**Fig. 3.** Forms of improving oral health prophylaxis knowledge, which respondents would use willingly.

or less often and 9.2% of women did so only due to complaints. Approximately 58% stated that gestation did not change the frequency of their dental visits. The frequency of visits to the dentist was not affected by income, education or place of residence.

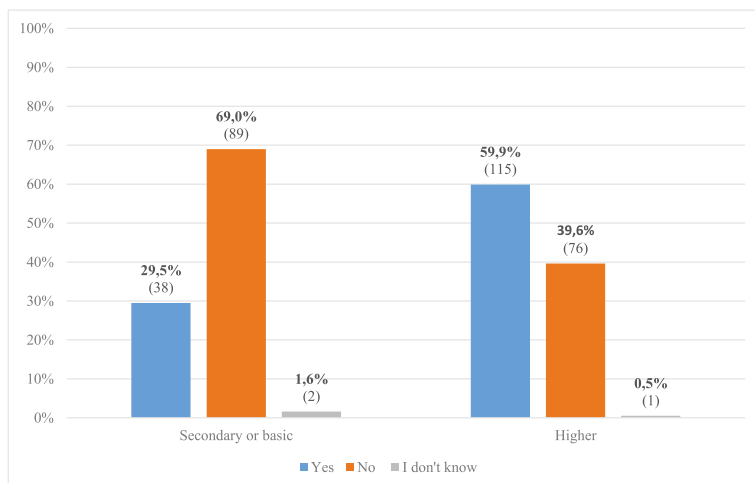
Most of the women were aware that they may be undergoing dental treatment during pregnancy (91.9%); 32.0% of the respondents considered the second trimester to be the most beneficial time for treatment, 9.6% indicated the first trimester and 5.4% the third trimester as the most favourable. 22.4% of the respondents stated that it would be better to postpone a treatment until after delivery, while 28.8% thought that it did not matter. Women with a higher education level, compared than those with secondary and primary education levels, believed more often that the second trimester was optimal for dental treatment or that it did not matter and less often that the first trimester was optimal or that treatment should be postponed until after delivery (Fig. 4). 36.8% of patients feared dental treatment. More than half of the respondents (55.6%) admitted that if dental treatment was reimbursed, they would use dental care more often. Personal financing of the treatment had no effect on the number of visits to the dentist in 44.1% of the respondents.

Over one-third of respondents (36.4%) used dental floss daily. Approximately one-half of the respondents (48.4%) used additional hygienic utensils (e.g. rinses), and only 15.0% underwent professional hygiene treatment in a dental office at least once a year. Pregnancy did not affect oral health according to the majority of respondents (53.7%), whereas 33.1% reported bleeding gums, and 17.0% had an increased incidence of tooth decay, less often ulcerations or erosions of the mucous membrane, pregnancy epulis, loosening and tooth loss (5.7%).

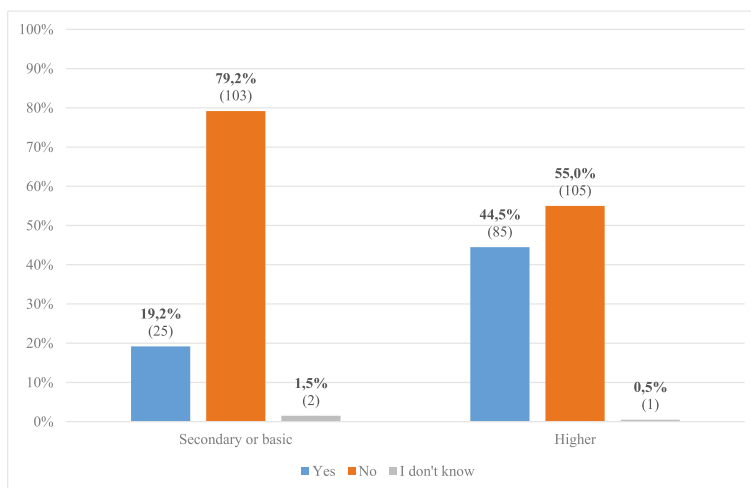


**Fig. 4.** The most favorable time for dental treatment — in relation to the education level of respondents,  $p = 0.029$ .

Most women (71.1%) thought that their teeth were more susceptible to caries during pregnancy. Over one-half (54.2%) believed that local anaesthesia was a danger to the foetus. A significant number of the respondents claimed that the presence of periodontal disease in the mother did not lead to premature delivery (51.7%) or low birth weight (65.0%). A correlation between preterm low birth weight (PLBW) and education level was detected. Women with a higher education level were more often aware of the link between periodontal disease and PLBW compared with women with middle and primary education levels (Fig. 5, 6).

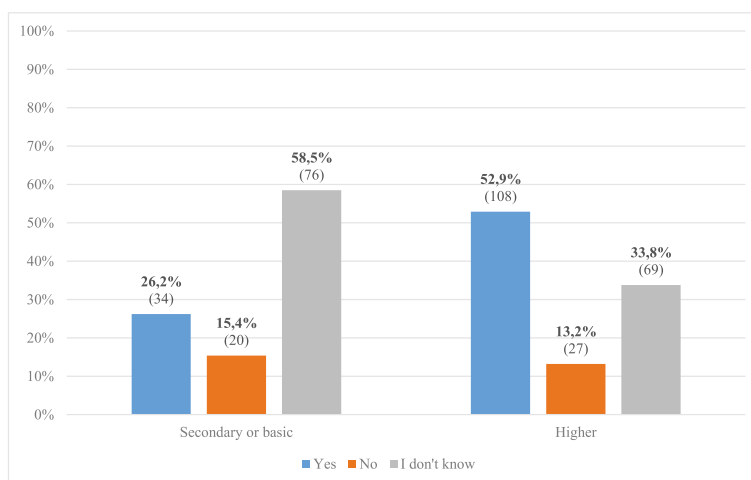


**Fig. 5.** Connection between periodontitis and preterm birth — in relation to education level,  $p < 0.001$ .



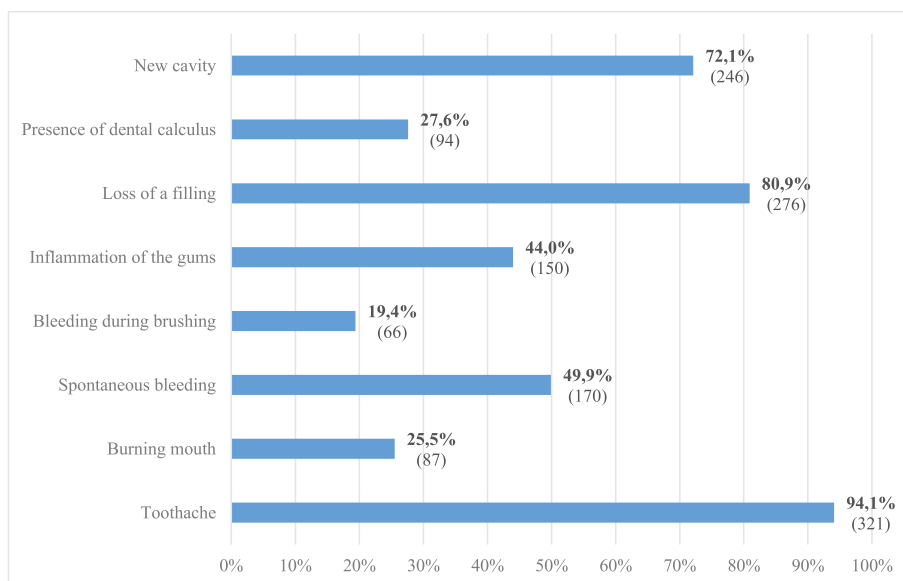
**Fig. 6.** Connection between periodontitis and low birth weight — in relation to education level,  $p < 0.001$ .

The link between poor dental conditions in the mother and the occurrence of dental caries in children was confirmed by 42.1% of respondents, whereas 14.5% believed there was no such relationship. Women with a higher education level more often responded correctly to that question (Fig. 7). Approximately 45.0% of future mothers admitted that they did not know how to take care of their child's oral health.



**Fig. 7.** Connection between parents' poor dental condition and occurrence of dental caries in children — in relation to education level,  $p < 0.001$ .

Most of the respondents (82.5%) agreed that preventive visits are necessary during pregnancy. A large proportion of pregnant women reported that they would consult a dentist in case of toothache, loss of a filling or a new cavity, whereas fewer would consult a specialist for symptoms such as burning mouth, bleeding during brushing or the presence of tartar. Less than one-half of the respondents would consider visiting a dentist in the case of inflammation of the gums or spontaneous bleeding (Fig. 8).



**Fig. 8.** Dental problems due to which the respondents would consult a dentist.

## Discussion

This study showed that the majority of pregnant women (78%) used dental care pre-pregnancy at least once a year. The frequency of dental visits during pregnancy did not change for most respondents, however it decreased for some of them, which could have caused adverse factors affecting oral health to be overlooked. This study revealed that more than 17% of respondents did not see the need for preventive dental visits during pregnancy. This is unsatisfactory considering the changes that occur in the oral cavity during pregnancy. Gingival tissue becomes more susceptible to microbes during pregnancy. Although pregnancy per se does not cause gingivitis, it can exacerbate pre-existing pathologies [9].

Periodontal inflammation is caused by bacterial plaque, which is responsible for pregnancy gingivitis, also affected by hormonal factors. Pregnancy gingivitis may occur subclinically or as mild gingivitis with slight bleeding during brushing. Bleeding,



described as the pink toothbrush symptom, occurs in approximately 50% of women. However, its frequency varies from 30 to 100% [10–12] and depends to a large extent on the level of hygiene [13]. During pregnancy the colour of gingiva varies from dark-pink to purple-red because of increased vascularity [14]. Moreover, gingival swelling, thickening of the marginal gingiva and hyperplasia of the interdental papillae with the formation of purulent pockets may be observed [14].

Approximately 5% of pregnant women experience so-called pregnancy epulis, also known as a pregnancy tumour, which is a pyogenic granuloma [14]. This localized gingival enlargement can occur at any time during pregnancy, but usually during the first or second trimester. A pregnancy epulis is usually located in the vestibular area of the upper front teeth and is characterized by a rapid increase in size of up to 2 cm in diameter [14]. A local irritant, such as a bacterial plaque or trauma, can be a triggering factor of the epulis [15]. The lesion usually disappears after delivery, which is also facilitated by decreased hormone levels [16].

Primiparas were more likely to undergo preventive actions than multiparas (Fig. 1), suggesting that first-time mothers seek greater care or that women with children do not seek new information in this area because of knowledge gained during the first pregnancy, which is often out of date and insufficient. An Italian study showed that over 50% of the parents surveyed were not aware of the possibility of transferring cariogenic bacteria through saliva, and a similar percentage of caregivers do not brush their children's teeth until age 3 [17]. In a study conducted in a Polish city, 40.4% of parents did not know when to start caring for the oral hygiene of their child, and 60.3% did not know the appropriate age for the first visit to the dentist [18].

It is advisable for parents to learn the proper oral hygiene methods for their child, such as cleansing with a swab moistened with boiled water from the first days of life, massaging the gums and brushing with fluoride toothpaste immediately after the first tooth has erupted. Considering the high incidence of caries in our society, the above information should be provided not only by the dentist, but also by the neonatologist, paediatrician, gynaecologist and midwife.

During pregnancy there is an increase in salivary secretion with a lower pH, which creates an unfavourable environment for remineralisation of enamel and leading to the development of caries [19]. Nausea, vomiting and symptoms of gastro-oesophageal reflux are frequently reported, particularly during the last trimester. The acidified oral environment decreases resistance in dental hard tissues and leads to the development of non-carious lesions of the erosion type [20]. Changes in blood levels of oestrogens, progesterone and human chorionic gonadotropin (hCG) have been considered in the aetiology of these disorders of the upper gastrointestinal tract [21]. The formation of gastroesophageal reflux is affected by advanced pregnancy with increased pressure in the abdominal cavity and weakness in the lower oesophageal sphincter, as

well as the hiatal hernia present during some pregnancies. Eating habits and energy demands change during pregnancy and lactation. The supply of carbohydrates and the frequency of meals increase, and snacking at night and between main meals may occur [22]. These behaviours can promote reproduction of acid-producing bacteria, increasing the risk of developing caries during this period.

The results of this study encourage women to expand their knowledge of hygiene and to prevent oral diseases through professional advice from medical workers. Our results suggest a need to broaden basic information on this subject during visits to a dentist and gynaecologist, not only in pregnant women but also in women of child-bearing age, and to conduct educational programs in antenatal schools. According to Iranian study the instructions given to pregnant women face-to-face have a strong impact on oral health behaviour compared with information distributed in leaflets [23]. A pregnant woman should receive from the gynaecologist information on the necessity of dental visits before at least 12 weeks of pregnancy [24]. Some studies indicate that more than 80% of respondents have not received such information [17], whereas only 30% of medical workers admitted that they directed their pregnant patients to the dentist [25].

Both dentists and gynaecologists should inform patients of childbearing age about the need for oral health care during pregnancy planning and pregnancy [24]. Studies conducted in Poznań showed that nearly one-third of pregnancies are unplanned [26]; hence, it is important to provide this information at the first visit. Negligence in this area is the main cause for most dental problems in pregnant women, especially gingivitis [24].

The lack of a proper dental intervention may lead to PLBW or even pre-eclampsia [24, 27]. The risk of premature birth in women with periodontitis can be up to eight times higher. This is explained by the secretion of many biologically active factors stimulated by bacterial exo- and endotoxins, which in turn, leads to the secretion of prostaglandins E<sub>2</sub> and F<sub>2</sub>, stimulating uterine contractions [28].

Inadequate maternal oral hygiene also affects birth weight [29]. In turn, caries in a pregnant woman increases the risk of caries in the child [30]. This is due to vertical transmission from the mother to the child of *Streptococcus mutans*, which is involved in the development of early childhood caries. A German study revealed that 78.6% of midwives inform pregnant women about the possibility of the occurrence of periodontal disease, but only 8.4% reported a relationship of periodontopathy to perinatal complications [31]. Other authors showed that less than 10% of medical employees inform patients about the association of poor oral health with childbirth or transmission of carious disease [25].

Gynaecologists should be aware of a patient's need to inform the dentist about their pregnancy; in studies in Poznań, only 46.7% of pregnant women reported this information to their dentist [26]. Another problem is the low reporting of pregnant

women to dental offices. In a study conducted in Turkey, one-half of patients reported that they did not visit the dentist because of a lack of dental issues; 5% of women claimed that the treatment was too expensive, and 4.6% were afraid that dental treatment would affect their pregnancy or foetus [32]. It is surprising that 14.7% of the respondents could not find a doctor willing to provide dental care to pregnant women [32], suggesting that some dentists do not have sufficient knowledge of dental care for pregnant women.

In an Australian study, primary care physicians, obstetricians, gynaecologists and midwives claimed that the obstacles to informing patients about the necessity of dental visits were the cost of dental treatment (56.9% of respondents), fear that dental treatment is not safe during pregnancy (63.2 %) and lack of knowledge about the risk of such treatment during pregnancy (53.9%) [25]. In Poland, many dental procedures are reimbursed by the insurance system for pregnant women, and the scope of services is broader for this group, which may be a decisive argument for some patients.

Many studies have reported the safety of dental treatment during pregnancy, claiming that the second trimester is the safest [24]. Concerns of the patient and gynaecologist, and even dentist, increase when local anaesthesia, antibiotic therapy or X-ray imaging is required.

Concise guidelines that contain actual recommendations for dental care in pregnant women may be helpful to gynaecologists. Such recommendations should be provided at the first visit, so that patients can safely visit the dentist at the appropriate time to prevent negative consequences of dental negligence, affecting the health of the mother and child. The following is a brief summary of the most common doubts among doctors and patients.

- Frequency of visits: at least once per trimester; when planning a pregnancy — review and sanitation before conception; obligatory dentist's follow-up visits entries in the pregnancy card [24].
- Basic oral hygiene: brushing with fluoride toothpaste at least twice a day for a minimum of 2 min and using dental floss at least once a day before going to sleep. If the pregnancy is accompanied by vomiting, it is important to rinse the mouth with a solution of 1 teaspoon baking soda dissolved in a glass of water [33].
- Dental treatment: performed during the second trimester [24], if necessary, any time throughout the pregnancy [33].
- Local anaesthesia combined with a vasoconstrictor (epinephrine): safe for the mother and child [24, 33]. The risk of harm imposed by endogenously secreted adrenaline during a stressful situation is greater than that imposed by epinephrine. The first-line drug is articaine with epinephrine (concentration 1: 200 000) [34], but lignocaine and mepivacaine may also be used [33].
- Dental radiological imaging: can be performed if required in the diagnostic and/or therapeutic processes [24, 33].

- Painkillers and antibiotics: given in accordance with the general guidelines for pregnant women.
- Chlorhexidine rinses: can be used if needed (7–10 days) [24].
- Removal of dental calculus (scaling): preferable during the second trimester [24] but, if necessary, any time throughout the pregnancy.
- Treatment reimbursed by the National Health Fund: women are provided additional benefits during pregnancy and puerperium, including check-ups once a quarter, removal of tartar once every 6 months, and endodontic treatment with treatment of up to three root canals.

## Conclusions

Women with higher education levels are better informed regarding the prevention of oral diseases, but their knowledge is still not satisfactory. Most women lack awareness of oral health prophylaxis, however only 23.4% of surveyed women indicated a need for it's improvement.

It is advisable to propagate preventive and educational programs to improve the dental knowledge of pregnant women, as well as to increase visits to gynaecological and dental clinics and classes in childbirth schools, to provide basic information on the oral health and hygiene of the mother and her child.

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## Author Contributions

- A.P.B. — article design, questionnaire collection, test design, execution of all tests, statistical analysis, manuscript writing
- A.J. — questionnaire collection, review of selected literature, manuscript writing
- I.M., K.S. — questionnaire collection, review of selected literature
- A.M. — patient qualification for the study
- J.P.P. — editorial amendments.

## Conflict of interest

None declared.

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